

DEVELOPING COMMUNITY BASED SUSTAINABLE ELECTRONIC WASTE MANAGEMENT MODEL

SHUBHAM GOSWAMI & VINEET CHOUHAN

Assistant Professor, Sir Padampat Singhania University, Udaipur, Rajasthan, India

ABSTRACT

Rapid economic growth united with growing intake of electrical and electronic equipment (EEE) and urbanization leads to creation of huge e-waste which is a source of hazardous wastes. E-waste or electronic waste is one of the fastest budding parts of the global waste stream. For evolving economies, these material flows satisfy the demand for cheap second-hand electronic and electrical apparatus. In total, there is a shortage of sturdy national guideline regarding recovering and trading materials waste electronic devices. For many urban and rural poor, recycling is also a source of living, but often causes severe health risks and for the local environment. Overall, there has been little research relatively to date on e-waste in evolving nations. Furthermore, past studies focused on producers, legislators, or recyclers but present study shift consideration to the role of community/consumers, which regulate when apparatus becomes e-waste and its clearance method. In sum, management of e-waste signifies a much better sustainability trial and need for community participation towards maintainable environmental management goals. Therefore, recent investigation sought to report this information gap with economic and social aspects of e-waste amongst community in developing country like India and their readiness to contribute towards maintainable e-waste management system. Study will use hypothetical background Theory of Reasoned Action (TRA) and Theory of Planned Behaviour (TPB) to describe the voter attitude towards e-waste management. This study also projected a communal based e-waste management system for suitable channelization of the electronic waste.

KEYWORDS: E-Waste, Sustainability, Community Model & India

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1. INTRODUCTION

E-Waste is different from industrial waste as it comprises both hazardous and valuable constituents that need distinct recycling procedures to evade ecological adulteration. Proper recycling can improve valuable metals and recyclable apparatuses. However, due to tough environmental regulations and high labour costs, advanced nations tend to transfer e-waste to poor nations [1, 2], where it is recycled using original methods with slight regard for employee safety of environmental safety. Developed nations have technological improvement to such degree that they dispose their e-waste products to the Asian countries like India. According to evaluations 80 percent of e-waste produced is transferred to Asian countries [1]. Hence, Asian nations like India face a quickly growing quantity of e-waste, both, from illegal imports and domestic generation.

Current e-waste management process in India is composite and contains numerous unorganized players. At first level, where the definite admission of the new electrical and electronic equipments (EEE), components, raw materials, gatherings in India happened either in the form of import or in the form of manufacturing, which is a well-organized segment. Disposal is the last stage, and this is mainly conquered by unorganized employees

involved in gathering and removal of e-waste with obsolete procedures along with other biodegradable waste. Thus, there is no distinct procedure of gathering, separation, and recycling of e-waste. Reusing not in compliance to environmentally friendly approaches is the key trial in India where there is no precise information on gathering and recycling of e-waste [1, 2]. The whole chain of collectors, dealers and recyclers add price and generate careers at each point. This social and economic influence needs to be unstated in inclosing waste management system.

General, there has been comparatively little study to date on e-waste in developing nations. Moreover, past studies focused on producers, legislators, or recyclers but current research shift consideration to the role of community/consumers, which regulate when apparatus becomes electronic waste and its clearance method. If the public have data about the adverse impact of electronic materials, then there are probabilities of learning the best approaches to discard the e-waste.

Therefore, present study sought to address this knowledge gap by learning economic and social features of community and e-waste preparedness to contribute towards supportable e-waste management system. Study also anticipated a community-based e-waste management system for appropriate channelization of the e-waste.

2. REVIEWS OF LITERATURE

Due to quick variations in equipment capabilities and features, reduction in charges, and the progress in internet use, the consumption and production of electronic equipment has been exponential in the last two eras [3]. Therefore, the huge volume of e-waste has created in industrialized nations [4] and that has become a main issue for the emerging countries where the treatment capacity is not appropriate, while in developed nations it is either shipped to developing countries including India, Ghana, China and Nigeria for recycling purpose for retrieval of treasured materials [5, 6, 7] or sent for recycling. But due to inappropriate recycling it also put adverse effect on the environment of country and on health of the local public [8]. Description of these wastes required leading substance for developing an environmentally sound, cost-effective and a public based sustainably managed recycling system [9].

The Community-based management (CBM) is a way of basic importance for resolving social problem associated with community members. Efficiency CBM can efficiently decrease the issues with less impact on other taxpayers [10, 11]. Water resource is the chief causes where it is being hired in most of assessments of management [12, 16], followed by forest management [14, 15], community services [1, 2], e-waste and solid management [16, 17, 18], etc. For solid waste management, CBM events are hired for both Municipal Solid Waste Management (MSW) or regular governmental services [19, 20] with Explicit Waste Management Services (EWMS) [21]. Under MSW gatherers collect electronic and additional garbage from houses, and sort and achieve wastes [10]. EWMS usually focuses on certain recyclables kinds of leftover and stay with their additional recycling events [17, 18]. It is thought that the achievement of e-waste management depends upon the political situation and social structure [10, 21]. CBM major profits includes increased incomes for community members [10, 23], better resource reutilization and the decrease of health risks from casual hunting [6, 17]. E-waste, is an evolving issue as well as a business chance of increasing significance, given the capacities of e-waste being created and the content of both valuable and toxic materials in them [24]. It is extremely toxic among all toxins predominantly when recycled or burned in unrestrained environments [21].

The Theory of planed behaviour (TPB) offers the prominent belief that impacts the behaviour at purpose of community towards the proper administration of e-waste of electronic equipment [25]. As per this concept new concepts can be taken from public, based upon their intention influencing their behaviour [10, 24]. Further by applying Theory of

Reasoned Action (TRA) the attitude towards the behaviour of community and insight regarding the e-waste and its management can be calculated [27].

Traditionally, environmental protection has been weak in the areas of conducting and planning operative monitoring, but by integrating ecological and social considerations, inspiring public participation, reassuring environmental apprehension can bring together a citizen-based supportable model [28]. Recent ecological management literature strains the necessity for public participation to recognize pointers to screen development towards environmental management and sustainable development goals [29]. As an emerging country India is facing huge challenges of dealing e-waste which are either imported illegally or internally generated to link the so-called 'digital divide' [30]. India has become simple 'backyard' for reusing methods [28]. It is tough to entirely replicate or adopt the e-waste management system in India due to exact problems like lack of infrastructure, socio-economic conditions, nonappearance of suitable legislations for e-waste [31, 32]. Though Legislation related to E-waste in India is made as E-Waste (Management) Rules, 2016, that offer the data regarding the duties of producers, collection centres, manufacturer, dealers, state government, recycler and customers. But these guidelines are not suitably tracked by participants as the majority of citizen disposes the e-waste as municipal trash itself [27, 30]. While buying the electronic equipment consumers should focus on the manufacturing facts [33]. If the people have information about adverse influences, then there are probabilities of learning the best follows to arrange e-waste [34]. Thus, it is significant to progress a community-based e-waste management system.

3. METHODOLOGY

Research used theoretical background Theory of Reasoned Action (TRA) and Theory of Planned Behaviour (TPA) to clarify the citizen attitude to e-waste management. Despite of its probable helpfulness, it has not been useful in e-waste management and planning. Initial level of study was investigative in nature which analyse present level of facts regarding e-waste and recognizes the factors manipulating its removal, followed by expressive research design. Information is composed using organized survey from a trial of 409 citizens drawn using critical sampling from chief cities of India. Initial pilot research was showed and an acceptable scale dependability value of 0.74 is attained tested using Cronbach alpha coefficient.

4. RESULTS

In line with the theory of planned behaviour (TPB), the current research verified the social- psychological viewpoints by investigating the relation between specific environmental attitude, purpose to contribute in e-waste behaviour and management. Model proposes that self-reported behaviour towards e-waste management is led by persons' purpose to pay for e-waste removal. This intention is in turn led by individuals' ecological attitude and perceived efficacy regarding their ability to defend the environment (i.e., perceived behavioural control). Model is tested using SEM to test all set of relations simultaneously. All scale items used to quantify constructs like intention, attitude and behaviour are significantly loaded in the measurement model. Figure 1 including the structural model showed the important standardised path coefficients. All the imagined associations were important in the anticipated way and the total model fit statistics are also decent (chi square=251.95, df = 15, $p < .001$; Adjusted Goodness of Fit Index [AGFI] = .91; Comparative Fit Index [CFI] = .89; Root-Mean-Square Error of Approximation [RMSEA] = .046).

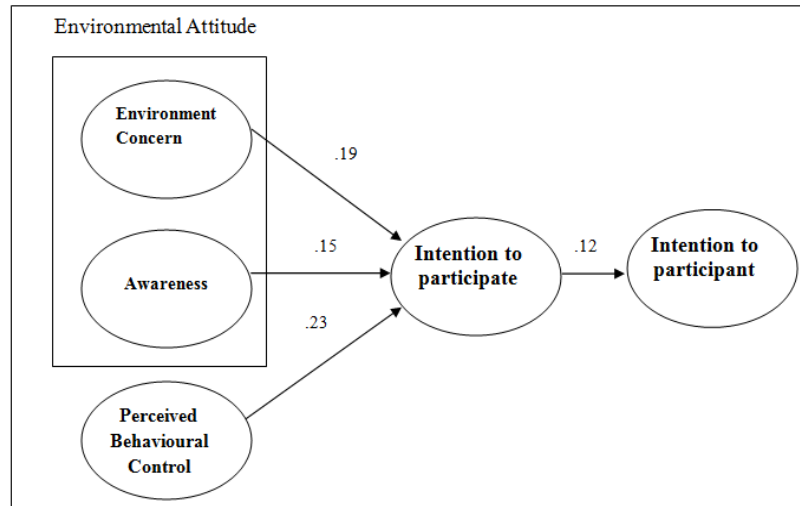


Figure 1: SEM Path Model with Coefficients

Research also examined some recognized e-waste management methods like extended producer responsibility (EPR) that makes the product manufacturer accountable for the entire life cycle of the product, particularly for the take back, reprocessing and final product disposal. The provision for EPR is offered in e-waste guidelines by the government but due to non-identifiable and large branded producers, it is tough to display the reprocessing for every business. Other mechanism contains Advance Recycling Fee (ARF) charged from customers to cover the reprocessing cost; Deposit-Refund System (DRS) where client get the additional fees refund when they return the product to specialized recyclers; and Transfer of Tax Credit (TTC) to recycling agencies and customers. Seeing the population size, all these methods need additional financial and administrative load on government.

The study also recommends community-based model (Figure 2) that comprise some basics of advance fees and tax credit. In the EEE generation stage, the importer and producer credit an advance fee based on quantity of toxic material used in their product. This delivery will depress the use of dangerous material by manufacturers. At the stage of WEEE generation, model recommends setting up a Community e-waste Center (CeC). The CeC would be fashioned on Public Private Partnership (PPP) model, where the private associates are certified recyclers itself. At the position stage of EEE, client offers the e-waste to CeC local chapter and in reappearance got the financial encouragement based on rates decided by e-waste task force. Further CeC is approved to sell the waste composed to registered recyclers, which can earn tax credit from financial and government profits by offering improved metal to raw material producers. The general model is ruled by national e-waste task power constituted by Ministry of Environment.

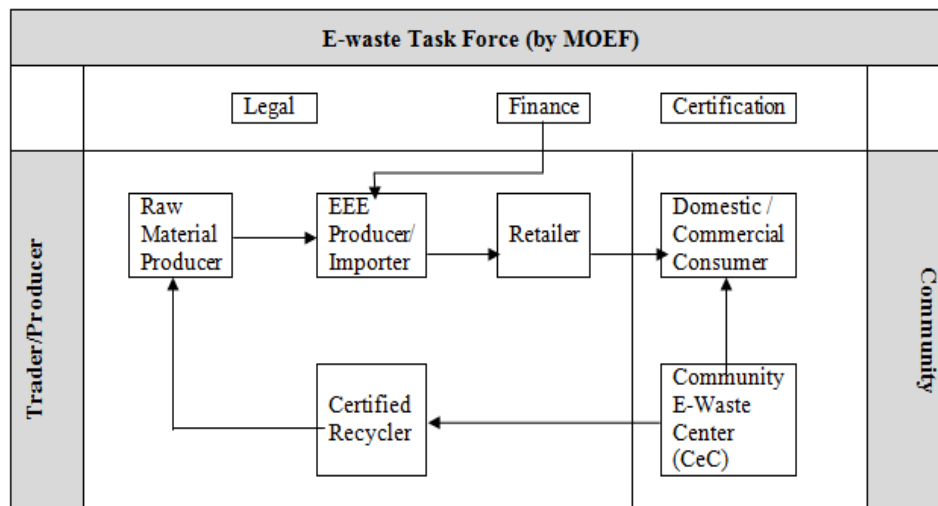


Figure 2: Community Based E-Waste Management Model

5. DISCUSSIONS

Current research measured the awareness level and community role willingness to contribute in conniving maintainable e-waste management model. Outcomes from studies exposed existing practices of e-waste management in India suffer from several drawbacks like the difficulty in waste collection, informal recycling, poor awareness, inadequate legislation and manufacturer's reluctance to address these serious issues. Lack of awareness about the dangers of improper recycling and low community participation is creating problems in a justifiable e-waste disposal system. The waste production can be reduced to a considerable extent, if the awareness about the e-waste is formed among the buyer. In accordance with earlier researches, current study also approves the significance of psychological constructs like environmental attitude in citizen action towards waste management. Existing study presented a community-based e-waste management system highlighting the role of public private partnership (PPP) and public in developing sound e-waste management approach. The proposed system may intensify the e-waste gathering and lead to more suitable use of properties.

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